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# Free associations and social representations: some reflections on rank-frequency and importance-frequency methods

Lionel Dany · Isabel Urdapilleta · Grégory Lo Monaco

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**Abstract** Free association is a technique frequently used for the collection of social representations, notably in the structural approach. Two methods are commonly used for analysing the associations produced. The rank-frequency method, which cross-tabulates the frequency of an item with its appearance ranking; the importance-frequency method (or ranked associations), which replaces the appearance ranking criterion with an importance ranking criterion which consists in ranking a posteriori the elements named. We carried out a comparative analysis of these two methods based on a collection of free association corpora concerning the representations of cancer ( $N = 55$ ), palliative care ( $N = 259$ ) and academic success ( $N = 138$ ). The results indicate that many subjects (82.96%) make changes to the spontaneously produced representation during the ranking of elements. These modifications directly affect the representational fields and the organisation of the representation. The a posteriori ranking of the representational elements allows the available knowledge on the object of representation to be re-contextualised and the accent to be placed on the functional aspect of the social element which is specific to social representations and not to prototypes.

**Keywords** Social representations · Free associations · Rank-frequency method · Importance frequency method · Structural approach

## 1 Introduction

From its beginnings, the social representations theory (Moscovici 1961) has been subject to substantial methodological research. Various works of synthesis have taken stock of the

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methods and tools used for collecting and analysing social representations (Abric 1994, 2003a; Doise et al. 1992; Moliner et al. 2002). Amongst the methods for collecting representations, we can single out the associative and reflexive approaches based on a variety of stimuli, amongst which the free association method occupies pride of place and is very much used (Abric 1994; Bovina 2006; De Rosa 1988; Garoscio 2006; Gaymard 2006; Laurens and Roussiau 2002; Michel-Guillou 2006; Sakalaki et al. 2010; Urbain and Gonzalez 2013; Vergès 1992; Wagner et al. 1996; Wolter et al. 2009).

### 1.1 The free association method

From a procedural point of view, the free association method consists initially in asking a subject to produce, from a stimulus word (the object of representation being studied), the words or expressions which spontaneously come into their mind. It allows us to access the latent dimensions which structure the semantic universe of the term or object being studied (Abric 2003b). This method allows to access the cognemes in order to describe representations (Lahlou and Abric 2011).

Within the framework of the study of social representations, “associative tests aim to reveal traces from the collective memory and to reason on the structure of these latter” (Flament and Rouquette 2003, p. 58). Free association presents a certain number of advantages: it allows data produced from the free expression of individuals to be processed directly, it is quick to implement and analyse, and it is easy to use and understand (Abric 2003b; Moliner et al. 2002).

Four main techniques can be highlighted (Jodelet 1972; Flament and Rouquette 2003) which are based on the cross-tabulation of two criteria. The first is a criterion of number. So a subject can be asked to produce one, two, three or even  $x$  words. Within the framework of studies revolving around objects of social representation, 3 and 5 responses are most often requested (e.g. Dany and Apostolidis 2002; Guimelli and Deschamps 2000; Lo Monaco et al. 2009; Sakalaki et al. 2010; Wolter et al. 2009). The second criterion is a criterion of limitation: the instructions may contain restrictions of a grammatical nature (e.g. reply using adjectives, nouns, etc.), of a semantic nature (e.g. reply with a term describing a feeling, Campos and Rouquette 2000) or of a substitutional nature (e.g. reply as a different category of people would, Guimelli and Deschamps 2000; Marie et al. 2010; Lo Monaco et al. 2009). The cross-tabulation of these two criteria thus produces four fundamental associative techniques (Flament and Rouquette 2003): the single-response free association (only one induced word without restriction), the single-response controlled association (only one induced word with restriction), the multiple response free association (several induced words without restriction) and the multiple response controlled association (several induced words with restriction). Of these four techniques, the multiple response free association is the most frequently used, notably within the framework of the structural approach to social representations (Abric 1976, 1987).

### 1.2 The structural approach of social representations

This approach, also referred to as the “central core theory” (see Rateau et al. 2011 for a review), postulates that a social representation is a hierarchized and organised system, composed of two interactive sub-systems: a central system and a peripheral system. The central system (or central core) includes a limited number of elements which constitute the common and consensual base of the collective memory and the system of norms to which a group refers (Abric 2001). The central system can be characterized (Abric 1993) by its link to collective

memory?and the history of the group, it is consensual, stable, coherent and rigid and not very sensitive to the immediate context. Furthermore, the central system presents different functions: it generates the signification of the representation and determines its organization. The central system encourages the consensus and the cultural and psychological homogeneity of a group or an individual. It is the “very foundation of the structure and nature of the representation” (Abric 1987 p. 68). The central status of an element is not limited to its quantitative dimension but also includes a qualitative dimension.<sup>1</sup> In other words, it is not the salience of an element which defines its centrality but the fact that it gives its meaning to the representation (Moliner 1994). Indeed, according to Moliner (1994) certain terms may be frequently named, to the point of encouraging the thought that central elements are involved, whereas this is not the case when a test of centrality (e.g. Moliner 1989) is subsequently performed. For example “the community of opinion” in the social representation of the ideal group is an element which from the quantitative point of view appears very frequently in the discourse of participants. However, when they are asked whether a group which does not share the same opinions is an ideal group, the majority of subjects reply in the affirmative, thus testifying to the fact that this element is not indispensable for defining the object “ideal group”, and that it is therefore not central. So, the salience of the representational field of an element is not necessarily the most reliable indicator of its structural status, in any case, this indicator does not seem to be sufficient. The peripheral system itself is composed of elements which give concrete expression to and illustrate the representation. They are more diverse and flexible than the central core elements. They are the elements most present quantitatively and which appear as an interface between the central core and concrete situations.

### 1.3 “Rank-frequency” method versus “ranked associations” method

Reference to the structural approach has repercussions on the way the processing of corpora obtained during free association tasks is envisaged. Indeed, once the corpus of associations has been collected, the choice of methodology for processing the data remains to be decided. The oldest method, entitled the “rank-frequency method”, consists in considering two rank indicators: the frequency of an item (or induced words) and its spontaneous appearance ranking. These two indicators are ontologically different (Vergès 1994). With frequency, comes access to a collective dimension: the number of times a word is cited in a reference population. So, as we have seen, in reference to Moliner (1994), frequency may constitute an indicator of quantitative centrality. Appearance ranking, on the other hand, corresponds more closely to an individual operation: the subject utters the words in accordance with their cognitive availability. Consideration of the appearance ranking of terms is based on what may be a cognitive property of the important elements of the representation, in other words these elements may be more available and so pronounced first. This orientation echoes Marbe’s law (Thumb and Marbe 1901) which postulates that there is a direct relationship between the frequency of an associative response and the speed of its utterance. And so, collocation of the naming frequency of the terms together with their appearance ranking may allow us to identify the most salient elements of a representation by mapping the quantitative and qualitative properties of induced words. In other words, the congruence of the two criteria (frequency and appearance ranking) may constitute an indicator of the centrality of an element (Abric 1994).

<sup>1</sup> According to Flament (2001), the term structure introduces this qualitative dimension. It constitutes “a collection of elements of such a nature that any qualitative change in an element automatically leads to the qualitative change of all the other elements” (p. 58).

**Table 1** The different categories of associations with the rank-frequency method (as defined by Vergès 1994)

Frequency	Appearance ranking	
	Low	High
High	Cell 1—core zone	Cell 2—potential change zone
Low	Cell 3—potential change zone	Cell 4—periphery

The cross-tabulation of these two criteria allows us to produce a four cell table which represents the four distinct zones of the representation (Table 1). In cell 1 we find the terms not only cited first but also frequently cited. This concerns the most salient and significant terms for the population being studied (Vergès 1994). This cell contains the elements which have a high probability of belonging to the central core, of forming the “organising core” of the representation (Grize et al. 1987). Cell 4 (Periphery) contains the terms least frequently cited and cited last. Cells 2 and 3 (potential change zones), give seemingly contradictory information. In one case (cell 3) the words are cited first but their frequency is low, in the other (cell 2), the high frequencies do not compensate for a much lower ranking. The two cells under consideration “constitute a potentially destabilising zone, a source of change, and of the development of reasoned arguments” (Vergès 2005, p. 155).

The presupposition supporting the cross-tabulation of frequency criteria and appearance ranking has been questioned (Abric 1994). The criticism concerns the premise according to which, in a word association task, the terms cited first are more important than the others. Indeed, some research demonstrates that the emotional quality or the abstract character of a stimulus interacts with the frequency of its use, which may lead to a “delaying effect” in the production of certain associations (Jones 1958; Winnick and Kressel 1965). More precisely, the principle of an importance conditioned by the memory accessibility of responses is challenged, notably because in a discourse “the essential things often appear after a period of warm-up, trust-building or reduction of defence mechanisms” (Abric 2003c, p. 53). This matching of associative products and discourse may actually be accepted if we take into account the isomorphic relationship which the associative system maintains with the language system embedded in verbal behaviour, which some research tends to demonstrate (Jodelet 1972).

To overcome this limitation, Abric (2003b,c) proposes substituting this “appearance ranking” with an “importance ranking” which consists in an a posteriori ranking of the elements named by the individuals themselves.<sup>2</sup> In other words, following a free association task, the subject is asked to classify the terms they have produced in accordance with the importance they allocate to each induced word in order to define the representation object being studied. This method is entitled “ranked associations” (Abric 2003c) or “free and ranked associations” (Abric 2003b). For our part, we will use the term “importance-frequency” in order to highlight the cross-tabulation of the two characteristics of the induced words being considered, as is the case for the rank-frequency method. As for the latter, the cross-tabulation of the two selected criteria (frequency and importance) allows us to produce a four cell table which corresponds to the four zones of the representation (see Table 2). Cell 1 always contains the potentially central elements of the representation but on the basis of their frequency and their importance. Cell 2 (first periphery) contains the important but infrequent items. Cell 3 con-

<sup>2</sup> A procedure combining the different criteria named (frequency, importance, appearance ranking) had already been proposed but it did not deal with the entire corpora of associations (e.g. Grize et al. 1987; Vergès 1995).

**Table 2** Analysis of ranked associations (as defined by [Abric 2003c](#))

Frequency	Importance	
	High	Low
High	Cell 1—core zone	Cell 2—first periphery
Low	Cell 3—contrasting elements	Cell 4—second periphery

stitutes the contrasting elements zone. The terms are named by few people but are considered as very important. Finally, cell 4 contains the infrequent and unimportant elements; this is the 2nd periphery.

If we compare the two methods, depending on the type of table they allow us to produce, we can see that cells 1 and 4 are very close in terms of interpretation. On one side we find the most salient elements (cell 1), and on the other the least salient (cell 4). The elements in cell 2 are different depending on the method used. In the “rank-frequency” method, they have the same status as those in cell 3, which is not the case in the importance-frequency model. This latter makes the elements of cell 3 more specific (contrasting elements), thus accentuating the role of the a posteriori ranking of induced words. We should note that with the use of this collection procedure and these analysis methods, we can only formulate hypotheses with regard to the central status of the elements present in the central zone. In fact, these two methods allow us to identify potentially central elements but do not allow us to formulate a formal diagnosis of centrality ([Moliner et al. 2002](#)). The formulation of such a diagnosis necessitates on the one hand, the employment of techniques based on a qualitative distinction between central cognitions and peripheral cognitions, such as the ambiguous scenario technique ([Moliner 1993](#)), the basic cognitive schemes model ([Guimelli and Rouquette 1989](#)) the “attribute challenge” techniques ([Moliner 1989](#)) or “test of context independence” ([Lo Monaco et al. 2008](#)). On the other hand, this method suffers from deficiencies with regard to the thresholds used for classifying each of the terms in one of the four cells based on the cross-tabulation of values in terms of frequency and importance or rank. Indeed, there is no unanimously agreed threshold beyond which the term may be considered as frequent and below which it may be considered as infrequent. Moreover, the determination of these thresholds for indicators of rank and importance seems arbitrary and uneven in the literature. Apart from these methodological problems, the presentation which we have just made demonstrates the methodological orientation of these models but above all highlights the fact that they are based on distinct epistemological presuppositions which confer a different status on the elements of the representation produced. However, these different premises have not, to date, been empirically supported ([Moliner et al. 2002](#)) in order to validate their relevance by verifying, for example, that these analysis options really produce differences in the organisation of representational fields. Indeed, even if these methods can be mobilized in the framework of a research on its own (e.g. Associative Network Method, [De Rosa 1995, 2003](#); [De Rosa and Kirchler 1998, 2001](#)), and have proposed some reflections about the processes engaged in their differentiation, to the best of our knowledge, no empirical study has tackle the question of the systematic comparison between the two methodological orientations. Moreover, if this is the case, the differences observed should be interpretable in the light of the social representation theory, and, more specifically, the structural approach to representations. This is what this methodological contribution proposes to study.

## 2 Method

We proceeded to carry out a double analysis (rank-frequency; importance-frequency) of various free association corpora. The first corpus of associations was produced by 55 patients from a medical oncology department (58.2% women, mean age = 58.41 years) using the stimulus word cancer. The second and third corpora concern the associations produced by two samples, one consisting of 164 doctors (59.3% women, mean age = 46.2 years) and the other of 95 nurses (91.6% women, mean age = 35.9 years), based on the term palliative care. Finally, the last corpus was produced by 138 secondary school pupils (52.1% young girls, mean age = 14.9 years) based on the stimulus word academic success.

In each study, the subjects were asked to produce the five words which came spontaneously to their mind based on the stimulus word (cancer, palliative care, or academic success). As a second step, they had to rank the words produced in accordance with their perceived importance in order to define the object of representation. So the first task (associative) and the second (ranking) allowed us to make use of two different corpora: the first being used as the object of a rank-frequency type analysis, and the second as the object of an importance-frequency analysis.

As a first step, the data produced by the questionnaires was analysed using the EVOC 2000<sup>©</sup> program. This software program was created following the study by Grize et al. (1987). On the basis of a lexicographical analysis, this program highlights the content of a representation and reveals the organising elements of this content. The analysis carried out is based on the cross-tabulation of two criteria: the appearance frequency of the term and its mean appearance ranking (Vergès 1994). The terms named by the individuals are considered as more or less salient on the basis of this double criterion. However, this software program allows us to analyse the ranked associations once they are encoded from the most important to the least important. The variations in methods (i.e. rank vs. importance) do not therefore constitute a restriction for analysis via this program.

As a second step, we carried out, for each object of representation, statistical analyses, which aimed to compare the mean ranking and importance scores of certain terms within the representational fields. Therefore we allocated a ranking and importance score to the terms produced: a term cited first was allocated the value 5, the term produced second the value 4 and so on. Likewise, a term classified as the most important was allocated the value 5, the one classed second in importance, the value 4, and so on. This procedure allowed us to have two scores (for rank and importance) for each term, on which statistical analyses were carried out (means comparisons; *t* test).

## 3 Objective

Our main objective was to carry out a comparative analysis of the two methods of free association analyses in the field of social representations: rank-frequency method and importance-frequency method (or ranked associations). This consisted, more specifically, in exploring any changes in the “structuring” of representational fields depending on the data processing mode applied. This exploration was carried out on two levels: a descriptive level and an inferential level. The first concerned the comparison of representational fields, as they may appear in data presentation tables. The second level aimed to compare statistically the mean ranking and importance scores of terms in order to explore the renegotiation level of these latter.

Our second objective was to investigate these possible changes with regard to the epistemological presuppositions of each method: a qualitative importance of the free associations determined, either by the rapidity of association due to the cognitive availability of the elements produced, or by a ranking task applied to this spontaneous production.

## 4 Results

We will present all of the results in two stages. Firstly, we will describe the representational fields produced by means of the associative tasks in accordance with the two data processing methods (rank-frequency vs. importance-frequency) for different objects of representation (cancer, palliative care, academic success). Secondly, we will present the comparisons of the mean ranking and importance scores for these terms.

### 4.1 Descriptive analyses of the different representations

We will present the results relative to the representation of cancer amongst patients in an oncology department, then those relative to the representation of palliative care amongst doctors responsible for palliative care units or teams and that for nurses based on the same object, and finally, we will present the results concerning the representation of academic success amongst secondary school pupils. In order to facilitate the reading of the differences between methods and corpora, we have selected a mean ranking and importance level of 2.5 (or the default value of the EVOC 2000<sup>©</sup> program) to differentiate between the elements.<sup>3</sup> Likewise, in order to differentiate between the words produced in accordance with their frequency (words frequently cited vs. infrequently cited), we have selected a threshold equivalent to 25 % of the overall membership of each sample. In fact, because of the comparative approach which we want to adopt, it seemed to us important to maintain identical thresholds for the construction of the “rank-frequency” and “important-frequency” tables. Therefore, the terms cited by at least one quarter of the subjects of a sample were considered as the most frequent terms, in other words, attributable to cells 1 and 2 of the table,<sup>4</sup> or the terms having a frequency higher or equal to 13 for the representation of cancer, those having a frequency higher or equal to 41 for the representation of palliative care amongst doctors and higher or equal to 23 for that amongst nurses, and finally the terms having a frequency higher or equal to 34 for academic success.

#### 4.1.1 Representation of cancer

The rank-frequency processing of the corpus concerning the representation of cancer demonstrates that the term “illness” forms part of the central core zone (Table 3). In the potential change zones the word “death” is found in the zone of elements having a high appearance ranking (cell 2). The terms “serious”, “tumour” and “fear” are found in the zone of elements

<sup>3</sup> No norm or method exists allowing us to define the mean ranking applicable to an object of representation by relying on the properties of the corpus collected or on theoretical presuppositions. In practice, the descriptive analysis of the corpus guides the definition of this threshold. And so, this varies according to the studies, without mention of the elements which led to its definition.

<sup>4</sup> We should note that, here again, no norm exists for the matter. And so, in the majority of cases the threshold used is not justified; it can vary from 3 to 50 % depending on the studies (e.g. Bovina 2006; Garoscio 2006; Michel-Guillou 2006; Sakalaki et al. 2010; Vergès 1994; Wolter et al. 2009); for the same object of representation it may also be different depending on the population studied (Gaynard 2006).

**Table 3** Representations of cancer amongst patients of an oncology department ( $N = 55$ )—rank-frequency method

Frequency	Rank	
	High	Low
High	Illness (25)	Death (15)
Low	Serious (11)	Chemotherapy (11)
	Tumour (6)	Recovery (10)
	Fear (4)	Suffering (9)
		Hope (5)
		Radiotherapy (5)
		Pain (4)
		Tiredness (4)
		Research (3)
		Treatment (3)
	Life (3)	

The figures in brackets indicate the frequency in which the terms were named

infrequently cited (cell 3). Finally, on the periphery we find terms such as “chemotherapy”, “recovery”, “suffering” and “hope” (cell 4).

Concerning the importance-frequency analysis of the “cancer” corpus, we should firstly note that 33 patients out of 55 made at least one change during the task of ranking terms produced spontaneously, amounting to 60% in total. This type of terms analysis produces results close to the rank-frequency analysis, notably cells 1 and 2 which are identical (Table 4). However, the contrasting elements zone is not identical to cell 3 of the processed rank-frequency data. The terms “tumour” and “fear” no longer appear there, the term “serious” accompanied by “hope” remains.

#### 4.1.2 Representation of palliative care (doctors)

The rank-frequency analysis of the corpus concerning the representation of palliative care amongst doctors shows that the terms “care” and “comfort” form part of the central core zone (Table 5). In the potential change zones (cell 2), we find the term “pain” amongst the elements with a high appearance ranking. The terms “end of life” and “illness” are found in the zone of elements infrequently cited (cell 3). Finally, on the periphery (cell 4) we find terms such as “death”, “listening”, “global” and “team”.

Concerning the importance-frequency analysis of the “palliative care” corpus produced by doctors, it can be seen that 138 doctors out of 164 (84.1%) made at least one change during the ranking task. Several changes can be observed (Table 6): the term “comfort” is no longer part of the central core zone (cell 1) and is found in cell 2 (first periphery). Likewise, the terms “end of life” and “illness” are found in the 2nd periphery (cell 4), whereas “quality-of-life” and “treatments” are found in the contrasting elements cell (cell 3).

#### 4.1.3 Representations of palliative care (nurses)

The rank-frequency analysis of the representation of palliative care amongst nurses (Table 7) shows that the terms “care”, “end of life” and “death” form part of the central core zone (cell

**Table 4** Representations of cancer amongst patients of an oncology department ( $N = 55$ )—importance-frequency method

Frequency	Importance	
	High	Low
High	Illness (25)	Death (15)
Low	Serious (11) Hope (5)	Chemotherapy (11)
		Recovery (10)
		Suffering(9)
		Tumour (6)
		Radiotherapy (5)
		Pain (4)
		Tiredness (4)
		Fear (4)
		Research (3)
		Treatment (3)
		Life (3)

The figures in brackets indicate the frequency in which the terms were named

**Table 5** Representations of palliative care amongst doctors ( $N = 164$ )—rank-frequency method

Frequency	Rank	
	Low	High
High	Care (100) Comfort (56)	Pain (43)
Low	End of life (32) Illness (16)	Death (33)
		Listening (31)
		Global (26)
		Team (25)
		Suffering (25)
		Providing relief (22)
		Treatments (21)
		Support (21)
		Respect (18)
		Quality of life (17)
		Family (14)
		Friends and family (12)

The figures in brackets indicate the frequency in which the terms were named

1). In the potential change zones, the term “pain” is found amongst the elements having a high appearance ranking (cell 2). No term is found in the zone of infrequently cited elements (cell 3). Finally, on the periphery we find (cell 4) terms such as “comfort”, “listening”, “helping” and “suffering”.

Concerning the importance-frequency analysis of the “palliative care” corpus produced by nurses, it can be seen that 80 nurses out of 95 (84.2 %) made at least one change during the ranking task (Table 8). Several changes are observable. Firstly, the terms “end of life” and “death”, initially present in the central core zone (cell 1) are now found in the first periphery

**Table 6** Representations of palliative care amongst doctors ( $N = 164$ )—importance-frequency method

Frequency	Importance	
	High	Low
High	Care (100)	Comfort (56) Pain (43)
Low	Quality of life (17) Treatments (21)	Death (33) End of life (32) Listening (31) Global (26) Team (25) Suffering (24) Providing relief (21) Support (20) Respect (18) Illness (16) Family (14) Friends and family (12)

The figures in brackets indicate the frequency in which the terms were named

**Table 7** Representations of palliative care amongst nurses ( $N = 95$ )—rank-frequency method

Frequency	Rank	
	Low	High
High	Care (62) End of life (44) Death (37)	Pain (43)
Low		Comfort (22) Helping (18) Suffering (18) Family (18) Support (16) Dignity (15) Providing relief (15) Management (14) Listening (13) Treatments (13) Sadness (9) Cancer (8)

The figures in brackets indicate the frequency in which the terms were named

(cell 2). The term "providing relief" appears in the contrasting elements zone (cell 3), whereas it was found in cell 4 (Periphery) during the rank-frequency analysis.

#### 4.1.4 Representations of academic success

Concerning the rank-frequency analysis of the representation of "academic success" amongst secondary school pupils (Table 9) shows that the term "work" is the only one to form part of the central core zone (cell 1). In the potential change zones, we find the term "diploma" in the zone of elements infrequently cited (cell 3) but no term is found in the zone of elements having a high appearance ranking (cell 2). Finally, on the periphery we find (cell 4) terms such as "studies", "profession", "future" and "good grades".

**Table 8** Representations of palliative care amongst doctors ( $N = 95$ )—importance- frequency method

Frequency	Importance	
	High	Low
High	Care (62) Pain (43) Death (37).	End of life (44)
Low	Providing relief (15)	Comfort (22) Helping (18) Family (18) Suffering (18) Support (16) Dignity (15) Management (14) Listening (13) Treatments (13) Sadness (9) Cancer (8)

The figures in brackets indicate the frequency in which the terms were named

**Table 9** Representations of academic success amongst secondary school pupils ( $N = 138$ )—rank-frequency method

Frequency	Rank	
	Low	High
High	Work (85)	
Low	Diploma (8)	Studies (31) Profession (26) Future (25) Good grades (22) Direction (21) Money (17) Serious attitude (14) Intelligence (14) Baccalaureate (10) Life (9) Learning (8) Grade (8) Success (7)

The figures in brackets indicate the frequency in which the terms were named

Concerning the importance-frequency analysis of the “academic success” corpus produced by secondary school pupils, we can see that 124 secondary school pupils out of 138 (89.85 %) made at least one change during the ranking task (Table 10). Compared with the rank-frequency analysis, we can observe that the changes are particularly noticeable in the contrasting elements zone. In fact, the term “diploma”, initially in cell 3 (potential change zone for the rank-frequency analysis) is here found in cell 4 (2nd periphery). Three terms present in cell 4 (Periphery) of the rank-frequency analysis are here found in cell 3 (Contrasting elements): “profession”, “direction” and “baccalaureate”.

To summarise, if we take account of all the “shifts” observed between the different cells for the four representational fields, we notice that: (a) three elements initially in cell 1 are found in cell 2; (b) no element belonging to cell 2 is found in cell 1; (c) five elements of

**Table 10** Representations of academic success amongst secondary school pupils ( $N = 138$ )—importance-frequency method

Frequency	Importance	
	High	Low
High	Work (85)	
Low	Profession (26)	Studies (31)
	Direction (21)	Future (25)
	Baccalaureate (10)	Good grades (22)
		Money (17)
		Intelligence (14)
		Serious attitude (14)
		Life (9)
		Learning (8)
		Diploma (8)
		Grade (8)
		Success (7)

The figures in brackets indicate the frequency in which the terms were named

cell 3 are found in cell 4 and (d) seven move from cell 4 to cell 3. “Shifts” of type (a) only concern the representation of palliative care, which is the only one to spontaneously have several elements in the central core zone. The other types of “shifts” (c and d) concern the three objects of representation.

#### 4.2 Comparative analysis of the different representations

After having created the rank and important scores, we made a comparison of these scores for each term appearing at least once in cells 1–3 of the different tables produced (Table 11). In total, 31 terms are concerned by these analyses. It can be seen that a majority of them ( $N = 18$ ; 58.06 %) have a mean ranking score higher than the mean importance score. Likewise, a majority of differences (21 out of 31, or 67.74 %) between the mean ranking and importance score prove to be insignificant. Amongst the significant differences ( $N = 10$ ), a large majority ( $N = 8$ , or 80 %) concern a reduction in the mean importance score in comparison with the ranking score. As for the three “shifts” observed in the central core zones, it can be seen that their mean importance scores are all significantly lower than their mean ranking scores. Moreover, the significant differences between the two score categories (mean ranking score vs. mean importance score) concern a little less than one half of the terms (7 out of 15, or 46.66 %), which were subject to “shifts” in the presentation tables (movement from one cell to another between the rank-frequency presentation and the rank-importance presentation).

The analysis of the table, for each representation, reveals that for the representation of cancer, only the term “illness” has a mean importance score significantly different from its mean ranking score. More precisely, its score is lower ( $M_{importance} = 4.20$  versus  $M_{ranking} = 4.76$ ;  $t(53) = 2.59$ ,  $p = 0.016$ ) when subjects rank it after having spontaneously named it. Concerning the representation of palliative care amongst doctors, it can be observed that three terms have mean importance scores significantly lower than their mean appearance ranking score: “end of life” ( $M_{importance} = 2.52$  vs.  $M_{ranking} = 3.67$ ;  $t(163) = 3.47$ ,  $p = 0.002$ ); “death” ( $M_{importance} = 2.36$  vs.  $M_{ranking} = 3.39$ ;  $t(163) = 3.92$ ,  $p < 0.001$ ) and “comfort” ( $M_{importance} = 3.50$  vs.  $M_{ranking} = 4.11$ ;  $t(163) = 3.35$ ,  $p = 0.001$ ). For the representation by nurses, it can be observed that three terms have an importance score

**Table 11** Comparison of mean ranking and importance scores for words named for the representation of cancer, palliative care and academic success

Representation (sample size)	Terms and frequency in which they were named	Means and SDs of ranking and importance				<i>t</i>	<i>p</i>
		Ranking	SD	Importance	SD		
Representation of cancer ( <i>N</i> = 55)	Illness (25)	4.76	0.52	4.20	1.19	2.585	0.016
	Serious (11)	4.18	1.25	3.55	1.44	2.055	0.067
	Recovery (10)	2.70	1.05	3.40	1.26	-1.655	0.132
	Tumour (6)	4.83	0.40	3.50	1.97	1.581	0.175
	Fear (4)	3.80	1.30	3.40	1.34	1.633	0.178
	Hope (5)	2.60	0.89	3.60	1.14	-1.581	0.189
	Chemotherapy (11)	3.36	1.28	2.73	1.19	1.170	0.269
Representation of palliative care— <i>Doctors</i> ( <i>N</i> = 164)	Death (15)	3.27	1.28	3.47	1.55	-0.356	0.727
	Death (33)	3.39	1.29	2.36	1.45	3.919	<0.001
	Comfort (56)	4.11	1.09	3.50	1.29	3.347	0.001
	End of life (32)	3.67	1.26	2.52	1.46	3.471	0.002
	Illness (16)	3.53	1.34	2.63	1.46	2.040	0.056
	Quality of life (17)	2.94	1.34	3.59	1.37	-1.454	0.165
	Care (100)	3.74	1.35	3.71	1.26	0.202	0.841
	Listening (31)	3.09	1.32	3.13	1.12	-0.126	0.901
	Treatments (21)	3.52	1.59	3.48	1.35	0.118	0.907
	Pain (43)	3.25	1.34	3.27	1.31	-0.114	0.910
Representation of palliative care— <i>Nurses</i> ( <i>N</i> = 95)	End of life (44)	4.00	1.31	2.89	1.40	4.489	<0.001
	Death (37)	3.57	1.36	3.03	1.59	2.275	0.029
	Providing relief (15)	3.27	1.43	4.07	1.03	-2.256	0.041
	Care (62)	3.78	1.10	4.07	1.17	-1.837	0.071
	Comfort (22)	2.84	1.28	3.16	1.34	-0.941	0.356
Representation of academic success ( <i>N</i> = 138)	Pain (43)	3.42	1.33	3.35	1.15	0.290	0.774
	Direction (21)	3.25	1.33	4.10	1.16	-2.904	0.009
	Work (85)	4.14	1.31	3.80	1.23	2.664	0.009
	Diploma (8)	3.63	1.30	2.25	1.75	3.274	0.014
	Studies (32)	3.31	1.40	2.88	1.23	1.724	0.095
	Profession (26)	3.46	1.26	3.75	1.20	-0.903	0.375
	Good grades (22)	3.32	1.28	3.00	1.23	0.877	0.390
	Future (25)	2.86	1.40	3.14	1.62	-0.779	0.442
Baccalaureate (10)	3.33	1.11	3.78	1.09	-0.800	0.447	

significantly different from their appearance ranking score: their importance scores of “end of life” ( $M_{importance} = 2.89$  vs.  $M_{ranking} = 4.00$ ;  $t(93) = 4.49$ ,  $p < 0.001$ ) and “death” ( $M_{importance} = 3.03$  vs.  $M_{ranking} = 3.57$ ;  $t(93) = 2.28$ ,  $p = 0.029$ ) are lower than their ranking scores; that for “providing relief” is higher ( $M_{importance} = 4.07$  vs.  $M_{ranking} = 3.27$ ;  $t(93) = -2.26$ ,  $p = 0.041$ ). Finally, it can be observed that three mean importance scores are significantly different from the mean appearance ranking score for the representation of academic success. Two of them are lower: “work” ( $M_{importance} = 3.80$  vs.  $M_{ranking} = 4.14$ ;  $t(136) = 2.66$ ,  $p = 0.009$ ) and “diploma” ( $M_{importance} = 2.25$  vs.  $M_{ranking} = 3.63$ ;  $t(136) = 3.27$ ,  $p = 0.014$ ), the last one has a higher importance score: “direction” ( $M_{importance} = 4.10$  vs.  $M_{ranking} = 3.25$ ;  $t(136) = -2.90$ ,  $p = 0.009$ ).

## 5 Discussion

Several elements of discussion can be advanced to accompany the reading of this group of results. The first concerns the impact of the introduction of an instruction to rank elements produced during a free association task. It can be seen that the addition of this instruction is not neutral; it provokes many "shifts" in the representational fields studied. And so, between 60 to almost 90 % of participants, depending on the representations concerned, make at least one change in the order of terms spontaneously named. In total, considering all representations together, 375 participants out of 452 made at least one change during the ranking of elements, amounting to 82.96 % in total. Yet, each "shift" of a term automatically leads to that of another term. So, the modification of the representational field concerns a minimum of two terms, or 40 % of the terms produced, for more than eight people out of ten. In other words, this instruction to rank, even if it gives access to similar content, actually has the effect of altering the organisation of the representational field for the objects studied and a large number of participants "seize on" the opportunity offered them to make changes in the order of the terms which they have spontaneously produced. This massive recourse to a "reorganisation" of the representational field is important as it suggests that the appearance ranking cannot be understood as an importance criterion for the terms. Indeed, if the terms spontaneously cited followed an order of importance, according to a cognitive salience criterion, they would not be subject to renegotiation. Yet, this renegotiation really takes place and it is massive.

Another element of discussion relates to the fact that the "shifts" observed operate in a specific manner. And so, no element initially positioned in the "peripheral" zone (Cell 2: potential change zone or first periphery depending on the model being considered) is positioned in the central core zone following the ranking of associations task. It can also be observed that certain terms initially present in the central core zone (e.g. representations of palliative care by doctors and nurses), no longer appear there following the ranking of elements by the subjects. So the a posteriori classification of elements according to their importance allows the central core zone to be modified. And so, the term "comfort" for doctors and the terms "end of life" and "death" for nurses are no longer considered as good candidates for centrality (central element of the representation). We should also note that the core zones of the representations of cancer and academic success are not modified, despite the fact that the importance score for the terms "illness" for the representation of cancer and "work" for that of academic success are significantly lower in comparison with their ranking score.

A more precise analysis of each representation may allow us to specify the impact of changes on the significance of the representations produced. With regard to the representation of cancer, it can be seen that although the term "illness" has a mean importance score significantly lower than its mean appearance ranking, it is still the most important element in the representation. In addition, terms with a more positive connotation gain in importance, such as "hope" which replaces "fear" and "tumour". And so, the representation loses its "anxiogenic" dimension following the ranking of induced words. This observation leads us to consider the question of the absence or presence of the ranking phase as a crucial point. Obviously, moving from the terms "fear" and "tumour" to that of "hope" demonstrates the whole issue, notably at the level applied, which accompanies this methodological question.

With regard to palliative care, it can be observed that the two representations revolve around "care". The movements observed in cells 3 demonstrate a reorientation of the representation around the practice. And so "quality-of-life" and "treatments" replace "end of life" and "illness" for the doctors, and "providing relief" appears in this cell for the nurses.

With regard to the representation of academic success, it can be observed that the representation is organised around the predominance of “work” as a condition of this success. In the peripheral zones, a shift can be observed between a short-term perspective (“diploma”) named spontaneously, in favour of more long-term perspectives which appear after ranking: “baccalaureate”, “profession”. Another point concerns the high mean importance score of the term “direction” which, following ranking, becomes the most important term. This result may be due to the context of answering questionnaires, which were presented by a Career Guidance trainee, during one of their exercises. This probably had the effect of making the theme of direction much more significant, and therefore the renegotiation of the importance of this term much more marked for the subjects questioned.

All of these elements demonstrate that between the spontaneous utterance of the terms and their ranking, we witness a modification of representations. In other words, the significant renegotiation of the representational fields testifies to a “meaning allocation” operation affecting each of the objects. More precisely, it is “finalised” (Dany and Abric 2007) for the individuals (a psychosocial logic governs this work of renegotiation and meaning, it is not the result of chance) and operates both on the central and peripheral zones.

To meet our second objective, it seems to us essential to now discuss the differences introduced by the two analysis methods at an epistemological level. Before beginning our purpose, we wish to emphasize that each method has a particular interest in the study of social representations. Indeed, nothing in our data shows that importance is better than rank. We want to present reflections that will specify theoretical issues and working hypotheses associated with these methods, and we will evoke the interest of thinking their articulation.

For many authors, appearance ranking is more a “criterion of prototypicality” than a criterion of rank and importance (Abric 2003b; De Rosa 1995, 2003; Grize et al. 1987; Moliner et al. 2002; Vergès 1992, 1995, 2005). Linking appearance ranking and prototypicality comes down to the dissociation of the appearance priority of the words in association tasks from the importance of these same words (Abric 2003b). As De Rosa emphasises (2003, p. 88), “the speed of association is not only an expression of the strength of the associative link and therefore of its salience, but also of its accessibility in terms of the widest prototypical consensuality”.

The analysis of properties associated with prototypes can allow us to clarify the distinction between the two methods studied. The prototype may be envisaged as the highest element on a scale of typicality (Poitou 2000). The accessibility of the element (i.e. the more or less rapid recognition or production of the members of a category) plays an important role and constitutes a procedure which aims at the definition of the prototype (Cruse 1990; Poitou 2000). This criterion of accessibility provides an approach to typicality (the fact that an example is typical or not of a category) and may be “addressed from the basis of the mean citation ranking of a term” (Poitou 2000, p. 19). The influence of the degree of typicality in cognitive performances, and notably categorisation, has been demonstrated by many experimental results. For example, in a categorising decision task, individuals take less time to reply when the example to be categorised is typical than when the example is not typical (Rosch 1973). It should always be borne in mind that typicality only constitutes raw data “whose basis, the causal antecedent, must itself be the object of an investigation via the detailed examination of the properties of elements as they are employed by the subjects” (Poitou 2000, p. 24).

A consensuality based on criterion of prototypicality constitutes a way to access the cognemes that constitute a collective description of the social representation’s field (as a spontaneous production associated to collective memory). But in our opinion it cannot constitute a sufficient guarantee for the understanding of the organisation of a social representation. What makes a central element in a representation distinctive, is not in fact the consensus

which it leads to, but rather its necessity (Flament 1994a), its non-negotiable (Moliner 1993) or inescapable (Flament 1994b) aspect. This necessity is a fundamental qualitative property of the central elements of a representation. The a posteriori ranking of the elements produced is a means of qualifying the nature of the link between the object of representation and the characteristics (elements) produced, in other terms, of expressing an opinion on the relative necessity of a characteristic of the object studied. And so, data processing of the importance-frequency type, takes on its full meaning within a structural perspective as ranking contributes to a selection, by ordination, of the necessary and sufficient elements.

The importance of the a posteriori ranking of representational elements allows the available knowledge on the object of representation to be re-contextualised and the accent to be placed on the “indispensable aspect of the social element” (Semin 1989) in the approach to social representations. For Semin (1989), it is a question of considering “the functionality of such classifications and processes which stems from the activities and aims of the person”, processes which “are, essentially, social and functional and based on discursive foundations” (p. 268). Indeed, although the cognitive organisation of knowledge on the object of representation is important, it is essential to bear in mind that the organisation of a representation is also socially significant. On this basis, the theory of social representations places the accent on the social nature of classification and categorisation operations (Moscovici 1984). And so, the work of organising knowledge on the object, specific to ranking, re-contextualises this knowledge in the sense that the subject is in a situation of communicating something of and about the object in a defined social context. Choosing to rank allows us to move from an approach to social cognition which would be strictly cognitive (closer to a prototypical analysis) to that of an approach to social cognition which reflects the sociocultural conditions which contribute to the creation and transformation of thought (Apostolidis and Dany 2013). This choice allows us to exceed, in part, the limit indicated by Farr (1983) who considers that one cannot study social phenomena in terms of individual mental processes. Such a paradigm presumes an insistence on the communicational components of social life and the taking into account of the multi-functionality of language and the role of argumentation (Parales Quenza 2005). In this sense, the option of ranking may be understood as a retroactive process vis-a-vis what was produced in a spontaneous manner by the individual in the first instance. In line with the propositions of De Rosa and Kirchler (2001) this contribution give the empirical elements of this return to the production of induced words which may resemble to a “reflexive revision” of the meaning or the conceptualisation of what one is in the process of doing (Pharo 2005). This reflexive revision phase seems to us to be all the more useful as the internal structure of the categories depends on cognitive constraints (i.e. typicality) but also on constraints linked to sequentiality on the psycholinguistic production processes (Dubois and Poitou 2002; Poitou 2000).

And so, following ranking, what is produced is no longer only the result of a memory or cognitive capacity linked to the accessibility of the elements but that of a “meaning allocation” task (and not just one of pronouncement) which aims to organise the knowledge about the object. The process of categorisation-classification associated with the a posteriori ranking of the elements of the representation allows us to reveal “the functional significance” of these latter in addition to the “associative significance” more characteristic of the rank-frequency method (Semin 1989, p. 268).

However, one principal limitation should be pointed out concerning the importance-frequency method. For example, somehow this method is more vulnerable to desirability bias than rank-frequency method. Indeed, subjects may well re-organize their production to give a positive image of themselves or of the object studied, and therefore to present some elements as less “important”, than their spontaneous production could foreshadow.

The combined use of the two methods may be more useful to identify the status of the elements of the representation studied. The comparative analysis of data allows to distinguish the cognemes that change from the cognemes that does not. Indeed, the change or the "shift" means in this case that the cogneme will appear in another cell or the mean score will be significantly different when comparing rank with importance. According to the central core theory (Abric 1993), we can hypothesize that elements/cognemes that does not change are more stable and not very sensitive to immediate context variations. The context-independence/dependence is probably the best criterion to diagnose the structural status of the representational elements (Lo Monaco et al. 2008; Wagner et al. 1996). In some ways, combining the two methods would allow to identify what aspects of the representation are more resistant to change (Lahlou and Abric 2011). If we want to know if an element is stable, the use of hierarchy—as a reflexive revision—is an appropriate method that will complement the prototypical approach that allows the rank-frequency method.

## 6 Conclusion

Our contribution is part of an attempt to question the methods and techniques available to researchers for the study of social representations (Apostolidis et al. 2011; Dany and Apostolidis 2007; Flament et al. 2006; Guimelli and Deschamps 2000). This questioning remains amongst the most relevant, useful and heuristic for the study of social representations. This work represents a first step in the investigation of the different premises inherent in the rank-frequency or importance-frequency analysis of free associations in the study of social representations. Our results indicate the value of using of both methods in a structural approach to representations. Further studies must be carried out in order to verify the propositions formulated. These could consist in exploring the effect of types of data processing (rank-frequency/importance-frequency) on other objects of representation and amongst different groups. Other investigative routes could be followed in order to compare the results obtained in relation to these two types of data processing and those which can be obtained with the central core identification traditional methods.

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